REMARKS

Applicant thanks the Examiner for carefully considering the application, and for indicating that claims 8, 9, 19 and 30 contain allowable subject matter.

Status of Claims

Claims 1-23 and 27-30 are currently pending. Claims 1 and 12 are independent.

Drawings

Fig. 5 is objected to for not separately identifying Figs. 5A-5D as specified in the specification. By way of this reply, Fig. 5 has been amended as required by the Examiner. Accordingly, withdrawal of the objection to the drawings is respectfully requested.

Applicant respectfully requests that the Examiner indicates acceptance of the drawings.

Claim Amendments

Independent claims 1 and 12 have been amended to clarify that the normal group delay is the envelope delay. Claims 10, 19, 27, 28 and 29 have been additionally amended for clarification purposes. No new matter has been added by way of these amendments.

Allowable Subject Matter

Claims 8, 9, 19 and 30 as indicated in the instant Office Action would be allowable if rewritten in independent form. As discussed below, amended independent claims are believed allowable. Thus, rewriting claims 8, 9, 19 and 30 in independent form is deferred at this time.

Rejections under 35 U.S.C. 112

Claims 1-11 and 27-30 are rejected as independent claim 1 is "vague and indefinite" as asserted in the instant Office Action. By way of this reply, claim 1

has been amended following the Examiner's suggestions. Accordingly, withdrawal of the rejection of claims 1-11 and 27-30 is respectfully requested.

Rejections under 35 U.S.C. 103

Claims 1-7, 10-18, 20-23, and 27-29 are rejected as being unpatentable over U.S. Patent No. 5,185,765 ("Walker") in view of U.S. Patent Application Pub. No. 20020000874 ("Thomasson"). For at least the following reasons, this rejection is respectfully traversed.

The claimed invention is directed to apparatus and method for ultra narrow band wireless communications. Independent claims 1 and 12 each require, in part, a filter having essentially no envelope delay. By contrast, Walker and Thomasson, whether considered separately or in combination, fail to show or suggest at least these claimed limitations.

When making the rejection, the instant Office Action has only addressed the claimed limitations "no group delay" as recited in the independent claims, and has failed to read in all of the limitations of the dependent claims, rendering the rejection improper. Accordingly, withdrawal of the rejection is respectfully requested.

To help advance the examination of this case, Applicant respectfully submits the following substantive arguments regarding the references cited in the instant Office Action.

Thomasson teaches a linear phase, indicating zero *differential group delay*, but *not zero envelope delay* (also known as normal group delay) as claimed. Differential group delay is the mathematical derivative of the actual envelope group delay, the latter being much larger. The differential group delay relates only to the distortion of the detected waveform where the frequency varies in the spectrum (Δf) (PSD). Normal group delay, or envelope delay, limits the data rate that can be transmitted due to the rise time of the filters, which are integrating devices (*see*, *e.g.*, Fig. 5 of the present application). Embodiments of the claimed invention use a filter that is as close to an RC differentiator as possible, with near zero rise time, which means no basic group delay in the

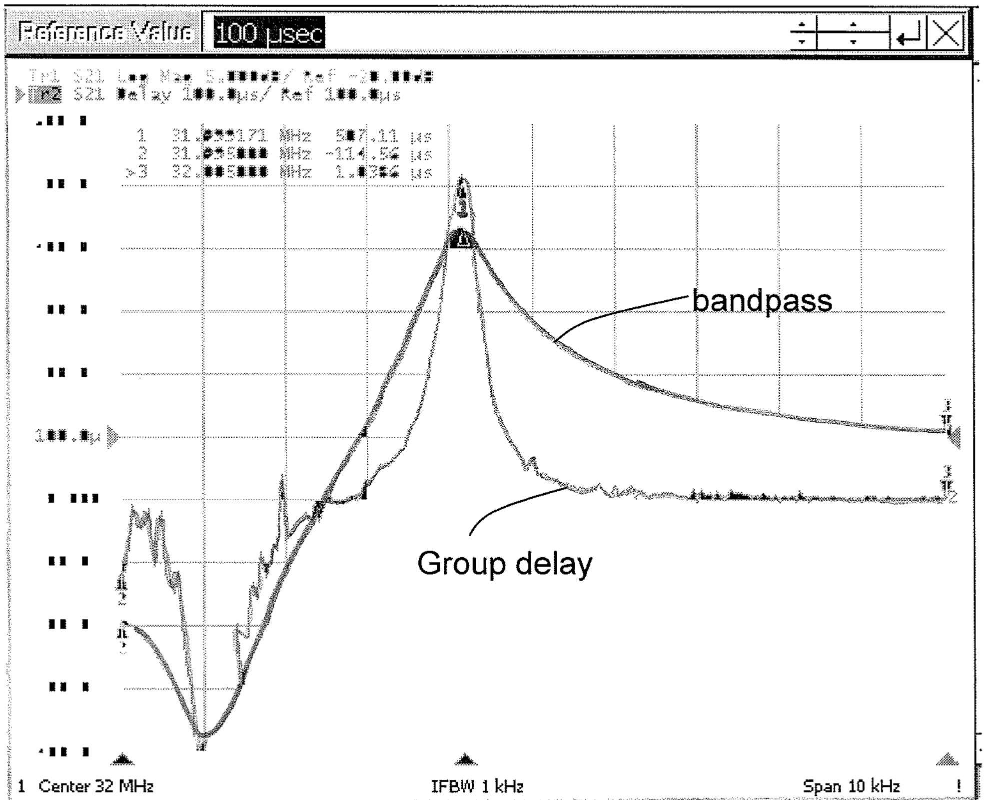
signal as passed. The differential group delay is immaterial, since the frequency does not vary (Δf) to cause distortion.

The differential group delay as taught by Thomasson represents only the change in group delay with frequency. *See*, *e.g.*, Exhibit A, where on page 295 it is noted that the actual group delay of the filter described therein is 170 nanoseconds, while the differential group delay at the peak is near zero. Gdel = $(1/2\pi)(d\Phi/df)$, while differential Gdel = d(Gdel)/df = Δ(Gdel)/Δf. The differential group delay is represented by the rippling sine wave in Fig. 1 of Exhibit A, which causes distortion of the detected signal in some modulation methods. Indeed, Exhibit A teaches "Linear Phase IF Filters and Detectors," while "linear phase" means zero differential group delay, but not zero envelope delay or normal group delay.

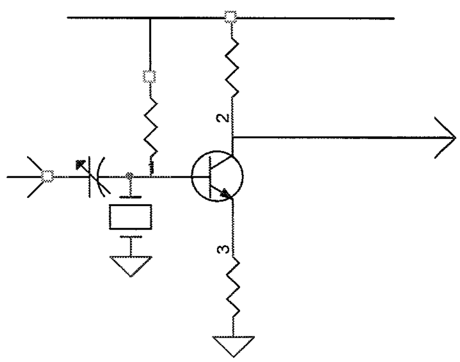
By contrast, embodiments of the claimed invention do not employ a broadband modulation method and do not require the alteration of the filter group delay to eliminate group delay distortion. Rather, the signal as transmitted is a single frequency without sidebands that cause bandspread (*see*, *e.g.*, paragraph [0008] of the published application – Pub. No. 20040121731). <u>Δf is not involved.</u> The half lattice type crystal filter used with embodiments of the claimed invention functions as a vector-adding filter that adds the energy stored in the large group delay for that single frequency and adds it vectorially to the incoming signal. The <u>envelope</u> delay is near zero. The very large nonlinear group delay (see below) does not allow the signal phase variation to pass through the filtering element itself. As a result of the group delay change, the differential group delay is very large except at the frequency peak. Any signal passing directly through the filter loses all phase modulation (*see*, *e.g.*, paragraph [0051] of the published application).

The measured response of the half lattice type filters is shown below. The group delay (the curve labeled with "1") in this measured example is 507.11 microseconds. The bandpass characteristic is shown by the curve with a label "Δ." The differential group delay is zero only at the single frequency at the resonance peak as marked by "marker 1." No effort is made in this filter to obtain

a zero group delay or zero differential group delay. The effective group delay relative to the incoming signal (envelope delay) is obtained by vector addition and is not the measured group delay. The effective envelope group delay is the same as the rise time of the filter, which must be nearly equal to one IF cycle. It is not the actual group delay of the filter or the differential group delay.



The single frequency vector adding application is novel. This is used in combination with a modulation method that yields a single frequency with no frequency deviation or spread ($\Delta f = 0$).

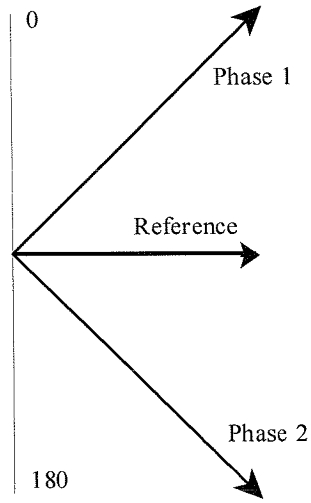


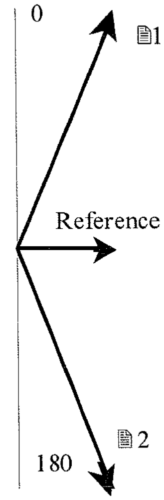
A shunt filter similar to that shown above may be used in the application (Fig. 5). The trimmer capacity tunes the crystal frequency. The transistor is a high impedance amplifier. The incoming signal passes directly to the transistor without passing through the crystal (*see*, *e.g.*, paragraph [0052] of the published application). The crystal "steals" energy from the incoming signal to store as an undesired reference for vector adding. All other filter types pass the signal through the resonating elements, where the signal is subject to group delay. The energy stored in the crystal, which is used only as a reference, is vector-added to the incoming signal.

The crystal acts as an impedance shunt, as described in paragraph [0052] of the published application, to achieve the bandpass filtering result. If it were not for the energy stored in the crystal that forms a reference, which is added, there would be no phase loss. The circuit would perform as an RC differentiator as shown in paragraph [0052] and Fig. 5 of the published application. The vector-added group delay applicable to the signal in passing is 1 IF cycle. For example, at 32 MHz (IF), the group delay of the vector-added signal is 31 nanoseconds, while the measured actual group delay is 507 microseconds. An RC differentiator has no rise time or envelope group delay. Near zero rise time of the filter to a phase change is the important feature.

The energy stored in the crystal becomes a reference (undesired) which is added. The incoming signal is added vectorially to give a vector-added resultant output with near zero rise time shown as Phase 1 and Phase 2 in the following drawing. The incoming signal is shown here as phase 1 = 0 and phase 2 = 180.

In embodiments of the claimed invention the angle may be approximately 90 degrees.





Thomasson teaches using two filters added vectorially to obtain a 3 dB crossover point, thereby achieving a zero differential group delay. The 3db crossover is described on page 294 of Exhibit A, and the flat group delay is shown on page 295. The actual group delay is not zero (about 170 nanoseconds), but the differential group delay over a narrow frequency range at the peak is near zero. The comments in Exhibit A regarding differential group delay refer to *passing the signal through the filter*, not to when the resonant elements are bypassed. This is not the type of filter used with embodiments of the claimed invention.

While the methods disclosed by Walker and Thomasson do reduce the actual group delay of the filter by a factor of approximately 4/1, and the differential group delay to zero, they do not provide a usable filter for the claimed invention, and do not show or fairly suggest all of the claimed limitations.

Embodiments of the claimed invention (*see*, *e.g.*, paragraph [0052] of the published application – Pub. No. 20040121731) use variations of a half lattice filter in which energy is stored in a crystal, and is then vector added to the incoming signal to result in a filter having a large nonlinear group delay at the peak resonance, but has near zero envelope group delay or rise time relative to the incoming signal, as a result of the vector adding. The signal does not pass

through the crystal with its group delay, but bypasses it while using the crystal only as a reference.

Dyer (U.S. Patent No. 4,630,285; listed in the Notice of Reference Cited but not relied upon in the instant Office Action), similar to Thomasson discussed above, teaches creating a filter with zero differential group delay. *See*, *e.g.*, Summary of the Invention of Dyer:

> We have discovered a method for processing an analog signal, and an apparatus for carrying out this process, which allows filtering without introduction of **differential time delays**. In particular, the method allows an analog signal to be converted to digital form and back again with zero group delay distortion.
>
> Accordingly, it is an object of our invention to provide a method which overcomes the above-cited disadvantages of the prior art.
>
> It is a further object to filter a message signal without introduction of appreciable **differential time delay**.
>
> Still another object is to provide an apparatus capable of filtering a message signal without introduction of appreciable differential time delay.
>
> A still further object is to convert an analog signal to digital form or a digital signal to analog form without introducing **group delay distortion**. ... (Emphasis added).

Indeed, similar efforts on eliminating group delay distortions are taught by many other references as well, many resulting in a fixed group delay of large value but near zero differential group delay.

Walker (US 5,185,765) does not show or suggest that a single carrier frequency is transmitted. Instead it clearly shows a wide bandspread (Δf) in one sideband equal to about 1/15 the data rate, which is transmitted. The modulation is a form of FM (Δf) with frequency deviation as derived from different time periods in the "slip coding." This is continuous phase frequency shift keying

modulation (CPFSK; *see*, *e.g.*, paragraphs [0005] – [0008] of the published application).

The Walker reference uses Single Sideband Suppressed Carrier Modulation (*see*, *e.g.*, Fig. 12). This method of modulation *suppresses the carrier* to as near zero as possible and exalts the sidebands, only one of which is transmitted, otherwise the bandspread equals the data rate. By contrast, embodiments of the claimed invention retain all of the carrier and suppresses the sidebands. This is counterintuitive as compared with conventional practice (*see*, *e.g.*, paragraph [0009] of the published application).

Conventional modulation methods all attempt to remove the carrier and contain all the useful information in the sidebands. In this sense, the Walker reference teaches a conventional method. In addition, the system as taught in the Walker reference may use the filter described in Exhibit A, but not the crystal shunt filter described in the present application.

More specifically, contrary to the assertions made in the instant Office Action, Figures 4A-5E of Walker do not teach the subject matter as claimed. All conventional filters are integrating filters similar to a correlator with an integrating time equal to the basic group delay. By contrast, the data in the carrier of embodiments of the claimed invention cannot be integrated or the information will be lost. The filter has zero rise time relative to a phase change (zero envelope delay). The filters shown in the Walker reference, and in Dyer and Thomasson, all have envelope group delay and rise time that would destroy the modulation as described in the present application. However, they do have zero differential group delay.

The Walker reference does not show or fairly suggest that the carrier contains all the necessary information as in embodiments of the claimed invention. In Walker there are Bessel products (Jo and J_1) which cause bandspread (Δf). By contrast, embodiments of the invention have no Bessel products. All of the sideband products are removable Fourier products. The Walker reference teaches *the use of the sidebands and removes the carrier* (Figs. 12A-12C) by using Single Sideband Suppressed Carrier (SSB-SC)

modulation. Without the sidebands, all modulation would be lost. The frequency spectrum (PSD) is not a single frequency, but a spread of frequencies (Δf) over a bandwidth approximately equal to 1/15 the data rate.

Col. 8, lines 29-32 of the Walker reference does state that the filter removes all higher order harmonics. However, this is necessary in all modulation methods only in the sense to meet FCC requirements. The bandpass filter in this case is stated to be an integrating filter of conventional type. This corresponds to the "Correlating Filter" described in many textbooks.

While filter types other than that shown could be used with the method of Walker, the monopole zero group delay filters derived from the half lattice crystal filter (Fig. 5 of the present application) of the claimed invention cannot be used with the conventional modulation method.

Embodiments of the invention transmit the carrier only (*see*, *e.g.*, paragraph [0033] of the published application). The removable Fourier sidebands have no effect whatsoever on the phase shift in the carrier, or in the frequency of the carrier. The necessary PSD is a single frequency as shown in Fig. 14 (144). There is no (Δf). The lower spectral components (146), known as "grass," are below FCC requirements. The spectrum has no required sideband components; hence all sidebands can be removed. This is not the case with the conventional methods.

In summary, conventional methods deal with differential group delay, which is a concept different from the envelope delay (normal group delay) as claimed.

In view of the above, the rejection as set forth in the instant Office Action is improper as only partial limitations of the independent claims are addressed. Accordingly, if not all the claims are allowed, Applicant hereby respectfully requests that a new, non-final Office Action be provided including details on which claimed limitations are rejected based on what, particularly for all of the dependent claims.

Further, as discussed above, none of the cited references, or any combination thereof, shows or fairly suggests all of the claimed limitations.

Accordingly, withdrawal of the rejection of claims 1-23 and 27-30 is respectfully requested.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant believes that the claims are in condition for allowance, and respectfully requests advancement of all the claims to allowance. The Examiner is encouraged to telephone the undersigned or his associates if it appears that a telephone interview would facilitate the allowance of the present application.

Respectfully submitted,

Feng Ma 2/20/2008

Feng Ma, Ph.D.
Registration No. 58,192
Myers Dawes Andras & Sherman LLP
19900 MacArthur Blvd., 11th Floor
Irvine, CA 92612
(949) 223-9600
Customer No.: 23386